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Area of Circle $\pi r^2 = (17 - 8\sqrt{3})\, r^2$

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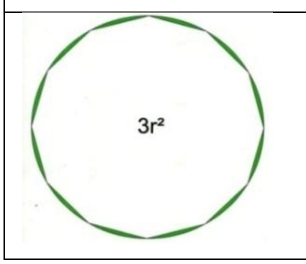
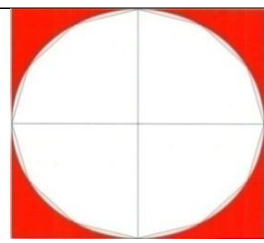
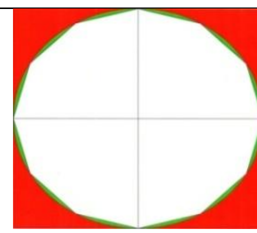
Abstract-- **Pi does not have any single exact value. The exact value of pi is impossible. Pi does not have an algebraic value. Squaring the circle making a square equal in area to a circle is impossible. Measuring the circumference of a circle exactly by a direct method up to the final point is impossible. The value of pi is a transcendental number, and so on. These are the concepts related to pi. Because of these concepts and the methods used to find the value of pi, the exact value of pi cannot be obtained. The methods used to find the value of pi such as polygons with many sides, number series, trigonometry, etc. cannot give the exact value of pi. Therefore, it is said that the exact value of pi is impossible.**

I say that if the subject of the value of pi is understood properly, then it is not so difficult. I have studied it using both geometrical and algebraic methods, and that is how it is.

I. Introduction

We know that the area of the regular polygon with twelve sides inscribed in a circle is $3r^2$ this is also universally accepted. Therefore, leaving aside the area of that polygon, I studied only the remaining part of the circle. I studied that part using both algebraic and geometrical methods. I derived equations for it please see them.

II. Geometric Method

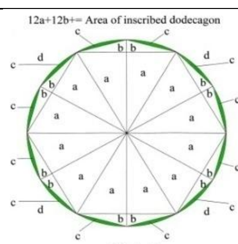
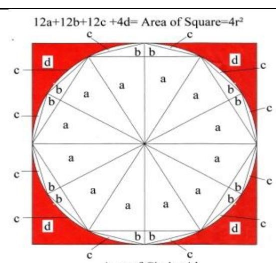
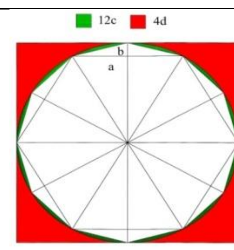
■ $(\pi - 3)\, r^2$	■ $(4 - \pi)\, r^2$	■ + ■ $= 1r^2 = (\pi - 3) + (4 - \pi)$
		

In the above methods, if the remaining part of the circle and the part removed from the square by the circle are added together, they come out to be $1r^2$ and the same. Then, within this single sum, how is $1r^2$ to determine how much belongs to the part inside the circle and how much belongs to the part outside the circle?

To find this, I found a method such that only their total sum needs to be taken; there is no need to separate them individually. This has already been published earlier.

III. Algebraic Method

Basic information: Note: let a, b, c & d each part shows area in following figures

		
Area of inscribed dodecagon $= (12a + 12b) = 3r^2$ $= (\pi r^2 - 12c)$	**Area of circumscribed square** $= (12a + 12b + 12c + 4d) = 4r^2$ $= (\pi r^2 + 4d)$	$(4 - \pi)\, r^2 = 4d$ $(\pi - 3)\, r^2 = 12c$ $(4d + 12c) = [(4 - \pi) + (\pi - 3)] = 1$

In the above algebraic method, first a hexagon was drawn inside the circle. Then, by taking the midpoints of the sides of that hexagon on the circumference, three diameters were drawn through them. After that, the endpoints of those diameters were joined to the vertices of the hexagon on the circumference, and thus a regular polygon with twelve sides was formed.

In that twelve-sided polygon, twelve triangles were formed inside the hexagon. Each of those triangles was named **Part-A**. Then, the twelve small triangles formed outside the hexagon were each named **Part-B**. Next, the remaining part of the circle outside the twelve-sided polygon was named **Part-C**, and the part of the square outside the circle was named **Part-D**.

Then the following relations were obtained:

- $(12a + 12b) = 3r^2$ (area of the inscribed dodecagon)
- $(12c + 4d) = r^2$ (area of the circumscribed square minus the inscribed dodecagon)

Since **A** and **B** in this method are triangular regions, their exact areas can be calculated.

Thus, 12a, that is the hexagon made of six equilateral triangles, has area
$6(\sqrt{3}/4)\, r^2 = 1.5\sqrt{3}r^2 = 12a$.

$a = (1.5\sqrt{3})/12 = 0.125\sqrt{3}r^2$

$12b = (12a + 12b = 3r^2) - 12a$

$b = (3r^2 - 1.5\sqrt{3}r^2)/12$

$= (0.25 - 0.125\sqrt{3}r^2)$

$= (12a + 12b + 12c + 4d) - (12a + 12b)$ $= (12c + 4d)$

$= (4 - 3)\, r^2 = r^2$ = area of ⅓ inscribed dodecagon $= (4a + 4b)$

i.e. $(4a + 4b = 12c + 4d)$ $(4a + 4b - 12c - 4d = 0)$

$(a + b - 3c - d = 0)$ equation no. 1

$(14b - 2a - 3c = 0)$ equation no. 2

$(13b + d - 3a = 0)$ equation no. 3

Above equations are equal & have value equal to zero. Which helps in determining value of 3c & d in terms of a & b

note x & y any number $x(14b - 2a - 3c) = 0$, $y(13b + d - 3a) = 0$

How the issue of **12C and 4D** was solved has been shown in a paper that was published earlier. Thus, using this algebraic method, the problem of the area of the circle has been solved.

In that paper, there are many algebraic equations related to the square surrounding the circle.

From those, only a few equations have been taken here. With the help of those equations and by using various derivations, the area of the circle is obtained as $(17 - 8\sqrt{3})\, r^2$

Some of the methods used in those derivations are given here.

I have geometric proofs for all of the following equations

Sr. no.	Equations of area of square = $4r^2$
1	$12a + 12b + 12c + 4d = 4r^2$
2	$18a + 2b + 3c = 4r^2$
3	$64b + 12c + 8d = 4r^2$
4	$20a – 12b + 6c = 4r^2$
5	$30a – 82b + 21c = 4r^2$
6	$-8a + 120b + 8d = 4r^2$
7	$128b – 24c = 4r^2$
8	$96b – 6c + 4d = 4r^2$
9	$4a + 68b + 4d = 4r^2$
10	$48c + 16d = 4r^2$
Total area of 10 square = $10(4r^2)$ =	$76a + 396b + 72c + 44d$ = area of 10 square = $10(4r^2)$

Area of 10 circumscribed square = $(76a + 396b + 72c + 44d) = 10(4r^2) + 0$

$= (76a + 396b + 72c + 44d) + 24(14b – 2a – 3c) + 44(3a – 13b – d)$

$= (76a + 396b + 72c + 44d) + (336b – 48a – 72c) + (132a – 572b – 44d)$

$= (160a + 160b) \quad = 40(4a + 4b) \quad = 40r^2$

Area of 10 circumscribed square $= 76a + 396b + \underline{72c + 44d}$ use equation $(3c + d = a + b)$

$= 76a+396b + \underline{(72c + 24d)} + (44d – 24d) \quad (72c + 24d = 24a + 24b)$

$= 76a + 396b + \underline{(24a + 24b)} + 20d$

$\underline{= 100a + 420b + 20d + 0}$

$= (100a + 420b + 20d) + 20(3a – 13b – d)$

$= 100a + 420b + 20d + (60a - 260b – 20d)$

$= 160a + 160b$

$= 40(4a + 4b)$

Area of (10 – 6) circumscribed square = $(76a + 396b + 72c + 44d) – 6(12a + 12b + 12c + 4d)$

= area of 4 circumscribed square = $(76a + 396b + 72c + 44d) – (72a + 72b + 72c + 24d)$

$= (4a + 324b + 20d) + 20(3a – 13b – d)$

$= (4a + 324b + 20d) + (60a + 260b – 20d)$

$= (64a + 64b) \quad = 16(4a + 4b)$

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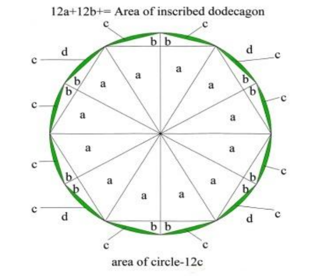
<td>
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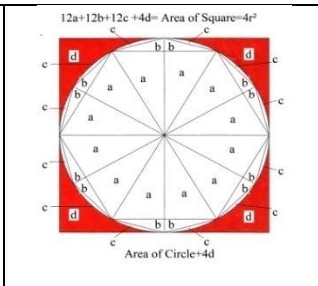
<td>
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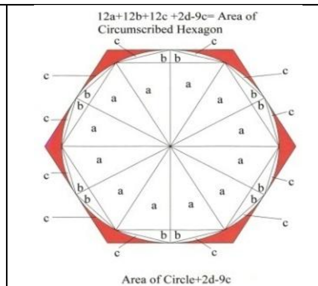
<td>
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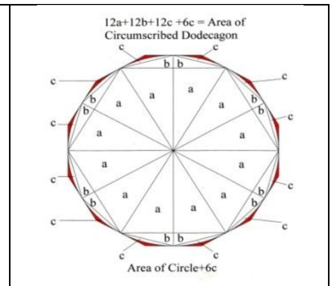
<td>
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<tr>
<td>Area of inscribed dodecagon
$= 3r^2$
$(\pi r^2 - 3r^2) = 12c$</td>
<td>Area of circumscribed Square
$= 4r^2$
$= (4r^2 - \pi r^2 = 4d)$</td>
<td>Area of circumscribed Hexagon
$= (2\sqrt{3})\, r^2$
$(\pi r^2 + 2d – 9c)$</td>
<td>Area of circumscribed Dodecagon
$= (24 - 12\sqrt{3})\, r^2$
$(\pi r^2 + 6c)$</td>
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(Area of circumscribed dodecagon – area of inscribed dodecagon) = 18c

(Area of 2 circumscribed hexagon + area of 3 circumscribed dodecagon) - $5\pi r^2 = 4d$

Area of 10 circumscribed square = (76a + 396b + 72c + 44d)

= (76a + 396b + 44d) + (72c = area of 4 circumscribed dodecagon – area of 4 inscribed dodecagon)

= (76a + 396b + 44d) + $4[(24 - 12\sqrt{3}) – 3]\, r^2$

= (76a + 396b + 44d) + $(96 - 48\sqrt{3})\, r^2 - 12r^2 + 0$

= (76a + 396b + 44d) + $(84 - 48\sqrt{3})\, r^2$ + 44(3a – 13b – d)

= (76a + 396b + 44d) + $(84 - 48\sqrt{3})\, r^2$ + (132a – 572b – 44d)

= 208a - 176b + $(84 - 48\sqrt{3})\, r^2$

= $208(0.125\sqrt{3})\, r^2 - 176(0.25 – 0.125\sqrt{3})\, r^2 + (84 - 48\sqrt{3})\, r^2$

= $(26\sqrt{3})\, r^2 - (44 – 22\sqrt{3})\, r^2 + (84 - 48\sqrt{3})\, r^2$ = $(40)\, r^2$

Area of 11 square – area of 10 square = 11(12a + 12b + 12c + 4d) – (76a + 396b + 72c + 44d)

= area of 1 square = (132a + 132b + 132c + 44d) – (76a + 396b + 72c + 44d)

<u>= 56a - 264b + 60c</u>

= 56a - 264b + (60c = area of 3⅓ circumscribed dodecagon - area of 3⅓ inscribed dodecagon)

= 56a - 264b + $3⅓\, [12(2 - \sqrt{3})]\, r^2 - 3⅓\, (3r^2)$

= 56a - 264b + $(80 - 40\sqrt{3})\, r^2 - 10r^2$

= $56(0.125\sqrt{3})\, r^2 - 264(0.25 – 0.125\sqrt{3})\, r^2 + (80 - 40\sqrt{3})\, r^2 - 10r^2$

= $(7\sqrt{3})\, r^2 - (66 – 33\sqrt{3})\, r^2 + (80 - 40\sqrt{3})\, r^2 - 10r^2$

= $4\, r^2$

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Proof no. 1

Area of 10 square $= 76a + 396b + \underline{72c + 44d}$ use equation $(3c + d = a + b)$

$= 76a+396b + \underline{(72c + 24d)} + (44d – 24d)$ $(72c + 24d = 24a + 24b)$

$= 76a + 396b + \underline{(24a + 24b)} + 20d$

$\underline{= 100a + 420b + 20d}$ use (area of square – area of circle) = 4d

= 100a + 420b + (20d = area of 5 square – area of 5 circle)

$= 100a + 420b + 5(4r^2)$ – area of 5 circle

$= 100a + 420b + 20r^2$ – area of 5 circle

Area of 10 square + area of 5 circle $= 100a + 420b + 20r^2$ use value of a & b

$= 100(0.125\sqrt{3})\, r^2 + 420(0.25 – 0.125\sqrt{3})\, r^2 + 20r^2$

$= (12.5\sqrt{3})\, r^2 + (105 – 52.5\sqrt{3})\, r^2 + 20r^2$

$= (125 – 40\sqrt{3})\, r^2$

Area of 5 circle $= (125 – 40\sqrt{3})\, r^2$ – area of 10 square

$= (125 – 40\sqrt{3})\, r^2 – 10(4r^2)$

$= (125 – 40\sqrt{3})\, r^2 – 40r^2$

$= (85 – 40\sqrt{3})\, r^2$

Area of circle $= (85 – 40\sqrt{3})\, r^2/ 5$

$= (17 - 8\sqrt{3})\, r^2$

Proof no. 2

Area of 10 square $= 76a + 396b + 72c + 44d$ $(72/6 = 12)$ $(44/4 = 11)$

= 76a + 396b + (72c = area of 12 circumscribed dodecagon – area of 12 circle)

+ (44d = area of 11 square – area of 11 circle)

$= 76a+396b + 12[12(2 - \sqrt{3})\, r^2 + 11(4r^2)$ – area of (12 + 11) circle

$= 76a + 396b + (288 - 144\sqrt{3})\, r^2 + (44r^2)$ – area of 23 circle

$= 76a + 396b + (332 - 144\sqrt{3})\, r^2$ – area of 23 circle

Area of 10 square + area of 23 circle $= 76a + 396b + (332 - 144\sqrt{3})\, r^2$

$= 76(0.125\sqrt{3})\, r^2 + 396(0.25 – 0.125\sqrt{3})\, r^2 + (332 - 144\sqrt{3})\, r^2$

$= (9.5\sqrt{3})\, r^2 + (99 – 49.5\sqrt{3})\, r^2 + (332 - 144\sqrt{3})\, r^2$

$= (431 – 184\sqrt{3})\ r^2$

Area of 23 circle $= (431 – 184\sqrt{3})\ r^2$ **– area of 10 square**

$= (431 – 184\sqrt{3})\ r^2 – 10(4r^2)$

$= (431 – 184\sqrt{3})\ r^2 – 40r^2$

$= (391 – 184\sqrt{3})\ r^2$

Area of circle $= (391 – 184\sqrt{3})\ r^2/ 23$

$= (17 - 8\sqrt{3})\ r^2$

Proof no. 3

Area of 10 square = (76a + 396b + 72c + 44d)

= 76a + 396b + (area of 6 circle - area of 6 inscribed dodecagon = 72c)

+ (Area of 11 square – area of 11 circles = 44d)

$= 76a + 396b -6(3r^2) + 11(4r^2)$ + area of (6 – 11) circle

$= 76a + 396b (– 18r^2 + 44r^2)$ + area of - 5 circle

$= 76a + 396b + 26r^2$ + area of - 5 circle

Area of 10 square + area of 5 circle $= 76a + 396b + 26r^2$

$= 76(0.125\sqrt{3})\ r^2 + 396(0.25 – 0.125\sqrt{3})\ r^2 + 26\ r^2$

$= (9.5\sqrt{3})\ r^2 + (99 – 49.5\sqrt{3})\ r^2 + 26r^2$

$= (125 – 40\sqrt{3})\ r^2$

Area of 5 circle $= (125 – 40\sqrt{3})\ r^2$ **– area of 10 square**

$= (125 – 40\sqrt{3})\ r^2 – 10(4r^2)$

$= (125 – 40\sqrt{3})\ r^2 – 40r^2$

$= (85 – 40\sqrt{3})\ r^2$

Area of circle $= (85 – 40\sqrt{3})\ r^2/ 5$

$= (17 - 8\sqrt{3})\ r^2$

Proof no. 4

Area of 10 square = 76a + 396b + 72c + 44d

= 76a + 396b + (72c = area of 4 circumscribed dodecagon – area of 4 inscribed dodecagon)

+ (44d = area of 11 square – area of 11 circle)

$= 76a+396b + 4[12(2 - \sqrt{3})\, r^2 – 4(3r^2)] + 11(4r^2)$ – area of (11) circle

$= 76a + 396b + (96 - 48\sqrt{3})\, r^2 – 12r^2 + (44r^2)$ – area of 11 circle

$= 76a + 396b + (128 - 48\sqrt{3})\, r^2$ – area of 11 circle

Area of 10 square + area of 11 circle $= 76a + 396b + (128 - 48\sqrt{3})\, r^2$

$= 76(0.125\sqrt{3})\, r^2 + 396(0.25 – 0.125\sqrt{3})\, r^2 + (128 - 48\sqrt{3})\, r^2$

$= (9.5\sqrt{3})\, r^2 + (99 – 49.5\sqrt{3})\, r^2 + (128 - 48\sqrt{3})\, r^2$

$= (227 - 88\sqrt{3})\, r^2$

Area of 11 circle $= (227 - 88\sqrt{3})\, r^2$ – area of 10 square

$= (227 - 88\sqrt{3})\, r^2 – 10(4r^2)$

$= (227 - 88\sqrt{3})\, r^2 – 40r^2$

$= (187 - 88\sqrt{3})\, r^2$

Area of circle $= (187 - 88\sqrt{3})\, r^2/ 11$

$= (17 - 8\sqrt{3})\, r^2$

Proof no. 5

Area of 10 square $= (76a + 396b + 72c + 44d)$

$= 76a + 396b +$ (area of 6 circle - area of 6 inscribed dodecagon $= 72c$)

$+ 11$ (area of 3 circumscribed dodecagon + area of 2 circumscribed hexagon – area of 5 circle $= 4d$)

$= 76a + 396b -6(3r^2) + 33[12(2 - \sqrt{3})]\, r^2 + 22(2\sqrt{3})\, r^2$ + area of (6 – 55) circle

$= 76a + 396b\, (– 18r^2 + (792 - 396\sqrt{3})\, r^2 + (44\sqrt{3})\, r^2$ - area of 49 circle

$= 76a + 396b + (774 - 352\sqrt{3})\, r^2$- area of 49 circle

Area of 10 square + area of 49 circle $= 76a + 396b + (774 - 352\sqrt{3})\, r^2$

$= 76(0.125\sqrt{3})\, r^2 + 396(0.25 – 0.125\sqrt{3})\, r^2 + (774 - 352\sqrt{3})\, r^2$

$= (9.5\sqrt{3})\, r^2 + (99 – 49.5\sqrt{3})\, r^2 + (774 - 352\sqrt{3})\, r^2$

$= (873 – 392\sqrt{3})\, r^2$

Area of 49 circle $= (873 – 392\sqrt{3})\, r^2$ – area of 10 square

$= (873 – 392\sqrt{3})\, r^2 – 10(4r^2)$

$= (873 – 392\sqrt{3})\, r^2 – 40r^2$

$= (833 – 392\sqrt{3})\, r^2$

Area of circle $= (833 – 392\sqrt{3})\ r^2/ 49$

$= (17 - 8\sqrt{3})\ r^2$

Proof no. 6

Area of 10 square = (76a + 396b + 72c + 44d)

= 76a + 396b + (area of 4 circumscribed dodecagon - area of 4 inscribed dodecagon = 72c)

+ 11 (area of 3 circumscribed dodecagon + area of 2 circumscribed hexagon – area of 5 circle = 4d)

$= 76a + 396b -4(3r^2) + 37[12(2 - \sqrt{3})]\ r^2 + 22(2\sqrt{3})\ r^2$ **- area of 55 circle**

$= 76a + 396b\ (– 12r^2 + (888 - 444\sqrt{3})\ r^2 + (44\sqrt{3})\ r^2$ **- area of 55 circle**

$= 76a + 396b + (876 - 400\sqrt{3})\ r^2$**- area of 55 circle**

Area of 10 square + area of 55 circle $= 76a + 396b + (876 - 400\sqrt{3})\ r^2$

$= 76(0.125\sqrt{3})\ r^2 + 396(0.25 – 0.125\sqrt{3})\ r^2 + (876 - 400\sqrt{3})\ r^2$

$= (9.5\sqrt{3})\ r^2 + (99 – 49.5\sqrt{3})\ r^2 + (876 - 400\sqrt{3})\ r^2$

$= (975 – 440\sqrt{3})\ r^2$

Area of 55 circle $= (975 – 440\sqrt{3})\ r^2$ **– area of 10 square**

$= (975 – 440\sqrt{3})\ r^2 – 10(4r^2)$

$= (975 – 440\sqrt{3})\ r^2 – 40r^2$

$= (935 – 440\sqrt{3})\ r^2$

Area of circle $= (935 – 440\sqrt{3})\ r^2/ 55$

$= (17 - 8\sqrt{3})\ r^2$

Proof no. 7

Area of 11 square – area of 10 square **= 11(12a +12b + 12c + 4d) – (76a + 396b + 72c + 44d)**

= Area of square **= (132a +132b + 132c + 44d) - (76a + 396b + 72c + 44d)**

<u>**= 56a – 264b + 60c**</u>

= 56a – 264b + (60c = area of 10 circumscribed dodecagon – area of 10 circle)

$= 56a - 264b + 10[12(2 - \sqrt{3})\ r^2$**– area of (10) circle**

$= 56a - 264b + (240 - 120\sqrt{3})\ r^2$**– area of 10 circle**

$= 56a - 264b + (240 - 120\sqrt{3})\ r^2$ **– area of 10 circle**

Area of 1 square + area of 10 circle $= 56a - 264b + (240 - 120\sqrt{3})\ r^2$

$= 56(0.125\sqrt{3})\, r^2 - 264(0.25 – 0.125\sqrt{3})\, r^2 + (240 - 120\sqrt{3})\, r^2$

$= (7\sqrt{3})\, r^2 – (66 - 33\sqrt{3})\, r^2 + (240 - 120\sqrt{3})\, r^2$

$= (174 – 80\sqrt{3})\, r^2$

Area of 10 circle $= (174 – 80\sqrt{3})\, r^2$ – area of 1 square

$= (174 – 80\sqrt{3})\, r^2 – (4r^2)$

$= (170 – 80\sqrt{3})\, r^2$

Area of circle $= (170 – 80\sqrt{3})\, r^2/ 10$

$= (17 - 8\sqrt{3})\, r^2$

Proof no. 8

Area of 10 square – area of 6 square = (76a + 396b + 72c + 44d) – 6(12a + 12b + 12c + 4d)

= area of 4 square = (76a + 396b + 72c + 44d) – (72a + 72b +72c + 24d)

= 4a + 324b + 20d

= 4a + 324b + (20d = area of 5 square – area of 5 circle)

$= 4a + 324b + 5(4r^2)$ – area of 5 circle

$= 4a + 324b + 20r^2$ – area of 5 circle

Area of 4 square + area of 5 circle $= 4a + 324b + 20r^2$ use value of a & b

$= 4(0.125\sqrt{3})\, r^2 + 324(0.25 – 0.125\sqrt{3})\, r^2 + 20r^2$

$= (0.5\sqrt{3})\, r^2 + (81 – 40.5\sqrt{3})\, r^2 + 20r^2$

$= (101 – 40\sqrt{3})\, r^2$

Area of 5 circle $= (101 – 40\sqrt{3})\, r^2$ – area of 4 square

$= (101 – 40\sqrt{3})\, r^2 – 4(4r^2)$

$= (101 – 40\sqrt{3})\, r^2 – 16r^2$

$= (85 – 40\sqrt{3})\, r^2$

Area of circle $= (85 – 40\sqrt{3})\, r^2/ 5$

$= (17 - 8\sqrt{3})\, r^2$

IV. Conclusion

There are many more methods like these, using different approaches, by which the same area of the circle = (17 – 8√3) r² is obtained.

REFERENCES

Previous Research Publications

The author has previously conducted extensive research on the exact value of Pi (π) and has published multiple research papers in reputed journals. The following works highlight the author's contributions to this field:

[1] Laxman S. Gogawale, Exact Value of Pi (π) = (17 - 8√3), IOSR Journal of Mathematics, Vol. 1, Issue 1, May-June 2012, pp. 18-35.

[2] Laxman S. Gogawale, Exact Value of Pi (π) = (17 - 8√3), International Journal of Engineering Research and Applications, Vol. 3, Issue 4, Jul-Aug 2013, pp. 1881-1903.

[3] Laxman S. Gogawale, Exact Value of Pi (π) = (17 - 8√3), International Journal of Mathematics and Statistics Invention, Vol. 3, Issue 2, February 2015, pp. 35-38.

[4] Laxman S. Gogawale, Exact Value of Pi (π) = (17 - 8√3), IOSR Journal of Mathematics, Vol. 12, Issue 6, Ver. I, Dec 2016, pp. 04-08.

[5] Laxman S. Gogawale, Exact Value of Pi (π) = (17 - 8√3), International Journal of Modern Engineering Research, Vol. 08, Issue 06, Jun 2018, pp. 34-38.

[6] Laxman S. Gogawale, Exact Value of Pi (π) = (17 - 8√3), International Journal of Mathematics Trends and Technology, Vol. 60, No. 4, Aug 2018, pp. 225-232.

[7] Laxman S. Gogawale, Exact Value of Pi (π) = (17 - 8√3), International Journal of Mathematics Research, ISSN 0976-5840, Vol. 12, No. 1, 2020, pp. 69-82.

[8] Laxman S. Gogawale value of pi exact or only approximate? The exact value of pi

[9] Laxman S. Gogawale New value of pi International Journal for Multidisciplinary Research (IJFMR) E-ISSN: 2582-2160 ● sept. 2025

[10] Laxman S. Gogawale, Value of π, a Mathematical Approach International Journal on Science and Technology (IJSAT) E-ISSN: 2229-7677 IJSAT25048923 Volume 16, Issue 4, ● October-December 2025

[11] Laxman S. Gogawale, area of circle = πr² = (17 – 8√3) r² TIJER !! c October 2025 Valume 12, Issue 10 !! www.tijer.org.

[12] Laxman S. Gogawale Volume 10, Issue 10, October– 2025 International Journal of Innovative Science and Research Technology ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25oct839